Storm Water Monitoring Evolution

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BMWM Storm Water Monitoring History

- 1994 Started with the Toms River NPS Pollution Study and Land use Model calibration.
- 4 sites with different land use patterns.
- Collect data for nutrients and microbiology to study loadings.

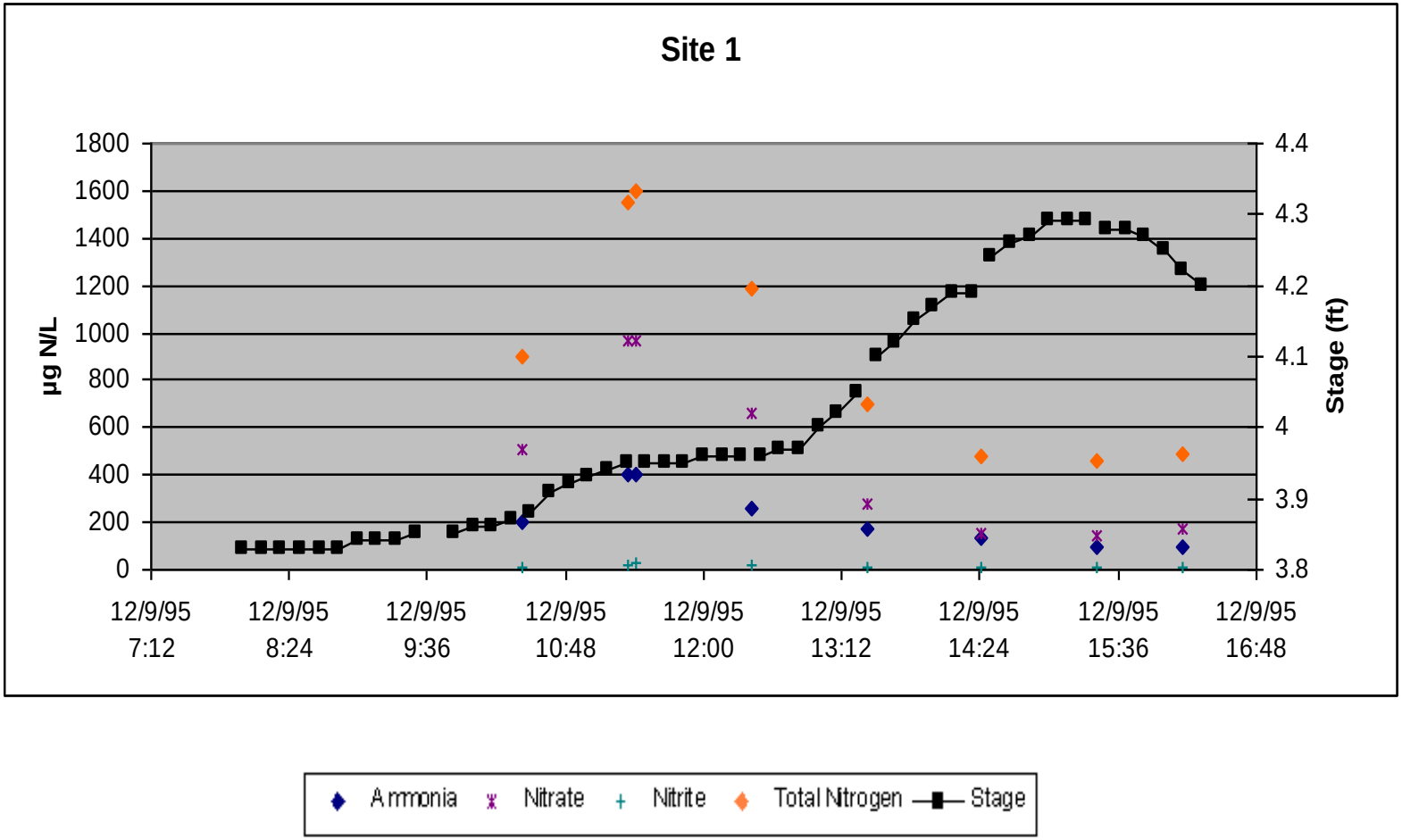
1994 Logistics

- Needed 10 staff members in the field for sample collection and processing.
- Handheld meters were used to take water quality measurements, sample bottle filled by field staff.
- Poor weather forecasting, no internet in the field, and not many good websites for weather forecasts, relied on phone calls with the National Weather Service in Mount Holly.
- Staff had to wait in the field for the rain event, to ensure capturing the “first flush” .
- Success of capturing storm events was 50%.

1995 Logistics

- Use of Automatic Samplers, flow meters, and multi-parameter continuous water quality monitors. Able to capture the “first flush” with the automatic sampler and flow meter.
- Reduced staff needed for a storm event to 3.
- Data also showed pollutant travel time, thus helping identify the potential location of the source.

Data Sonde


Site 1
µg N/L
Stage (ft)
1800
1600
1400
1200
1000
800
600
400
200
0
4.4
4.3
4.2
4.1
4
3.9
3.8
12/9/95 7:12
12/9/95 8:24
12/9/95 9:36
12/9/95 10:48
12/9/95 12:00
12/9/95 13:12
12/9/95 14:24
12/9/95 15:36
12/9/95 16:48
Ammonia
Nitrate
Nitrite
Total Nitrogen
Stage

Long Swamp Creek, Toms River

Total Suspended Solids

Long Swamp Creek, Toms River

Ammonium

Long Swamp Creek, Toms River

Hydrolyzable Phosphorus

- Toms River Study developed methods to monitor other locations and perform source tracking.
- Developed techniques to monitor streams in storm events, using automated equipment.
- Looked at the applicability of using automatic samplers for non-regulatory microbiological sample collection.
- Expanded on the use of alternate microbial indicators

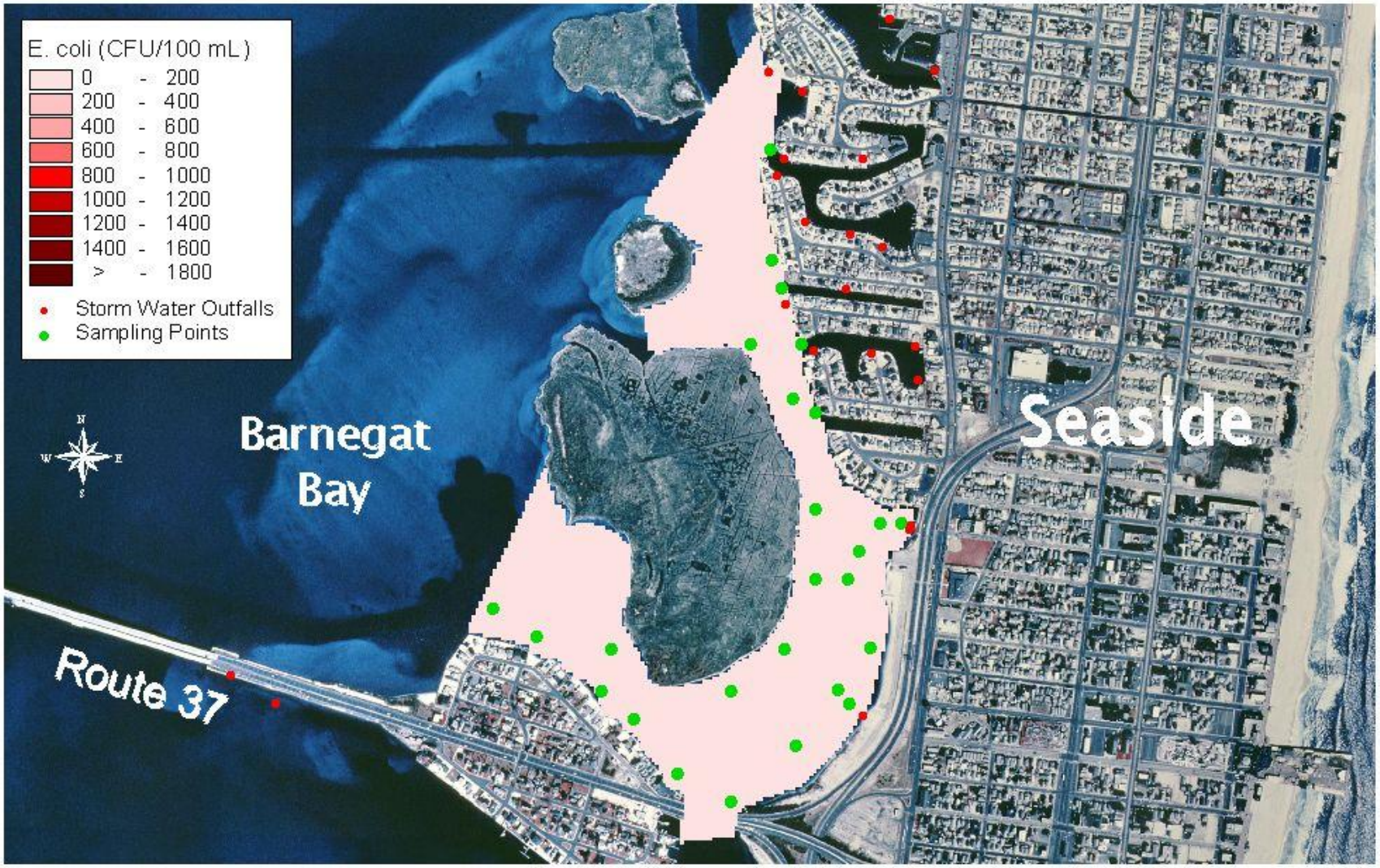
Other Studies

- Seaside Heights
- Jarvis Sound NPS
- Wreck Pond
- Parvin State Park
- Atlantic City
- Beachwood Beach
- Navesink River


30"-36" REPORTED STORMDRAIN WITH SUSPICIOUS DISCHARGE
TRENCH FOR PIPELINE
SEASIDE HEIGHTS ORTLEY BAY AREA
ABANDONED DOVER S.A. WASTE WATER TREATMENT FACILITY
APPROXIMATE LOCATION OF REPORTED MANNHOLES FOR BAY CROSSING SEWAGE LINES
SEAGULL ROOSTING AREA
STORM WATER OUTFALL
SEASIDE HEIGHTS PUBLIC WORKS YARD
Seaside.shp
Stormwater Outfall

Seaside Storm Water Project

Prior to Rainfall



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Seaside Storm Water Project

1 Hour After Storm Event Began

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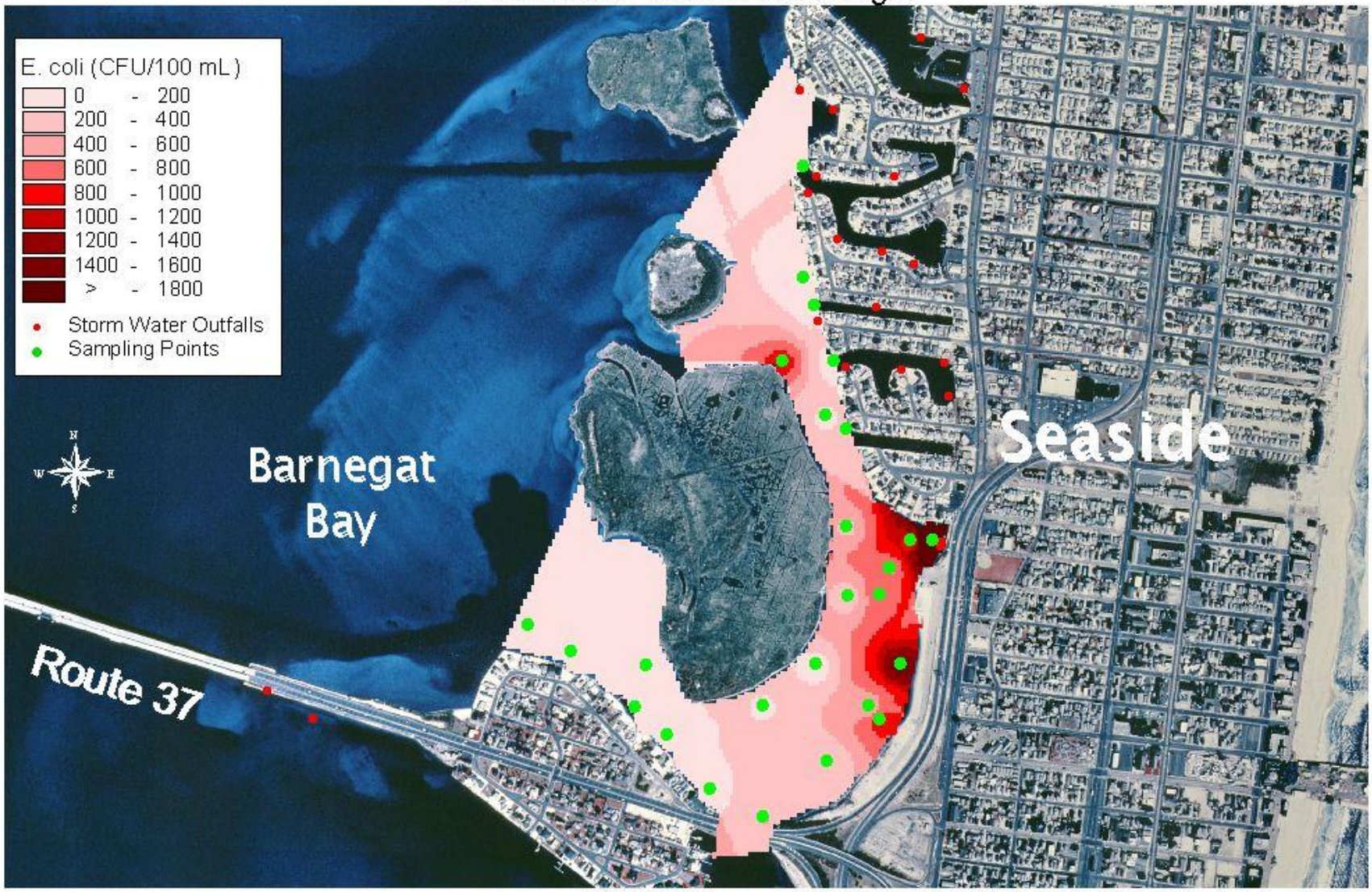
Seaside Storm Water Project

3 Hours After Storm Event Began



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Weather Forecasting

- Need to monitor long range and short term forecasts.
- Need to check the forecast 3 times daily to look for the trend in precipitation, and within 48 hours look for agreement between the different weather models.
- Main Models used are GFS, WRF(NAM)
- Using these models, we were able to be 98% successful in collecting events.

Weather Forecasts

- http://ready.arl.noaa.gov/READYcmet.php
- http://www.wbuf.noaa.gov/bufkit/bufkit.html

http://www.erh.noaa.gov/phi/bufkit.htm

- http://www.cnrfc.noaa.gov/weather_models.php
- http://www.erh.noaa.gov/er/phi/
- http://www.wunderground.com/radar/radblast.asp?ID=DIX

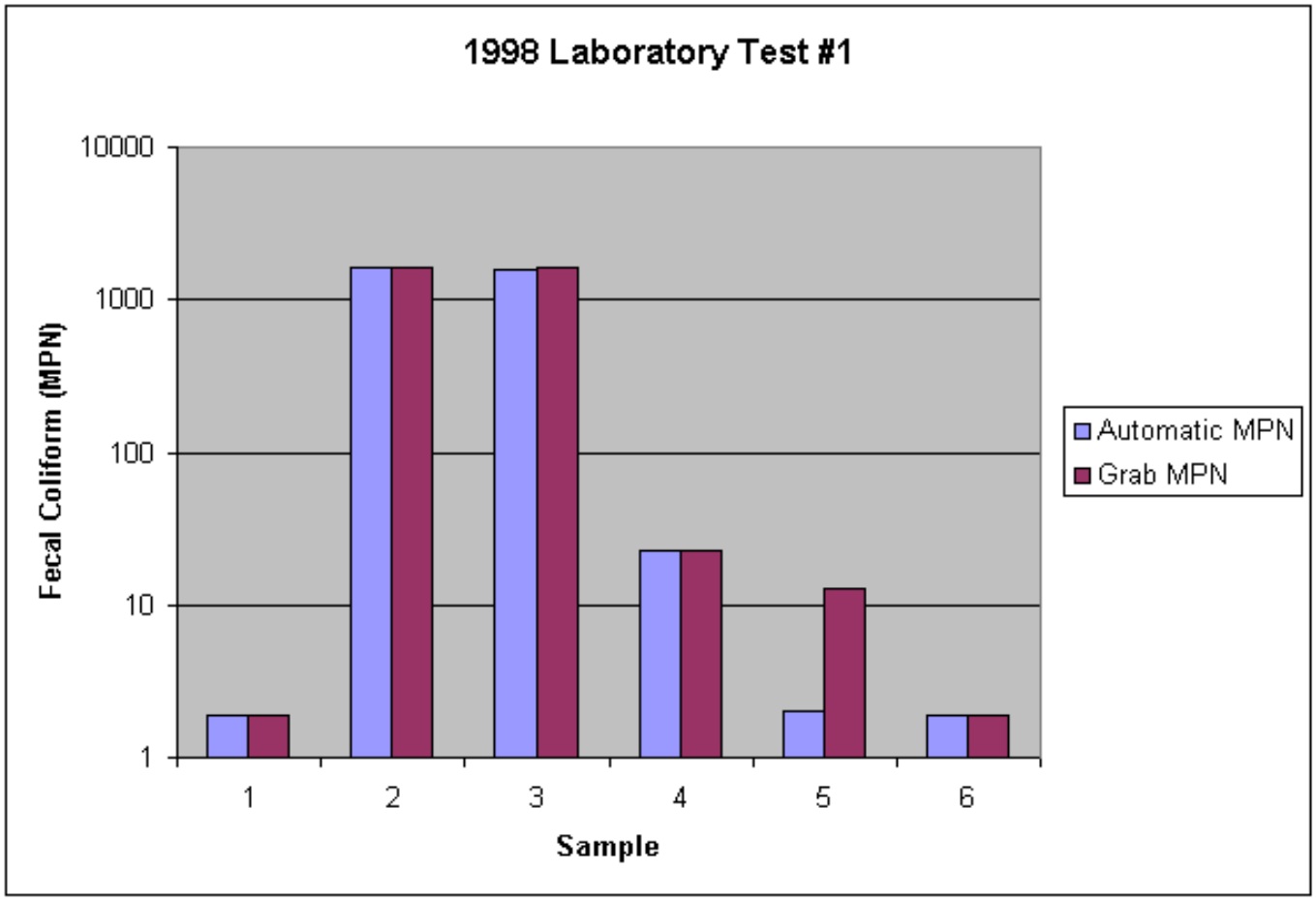
Weather Stations

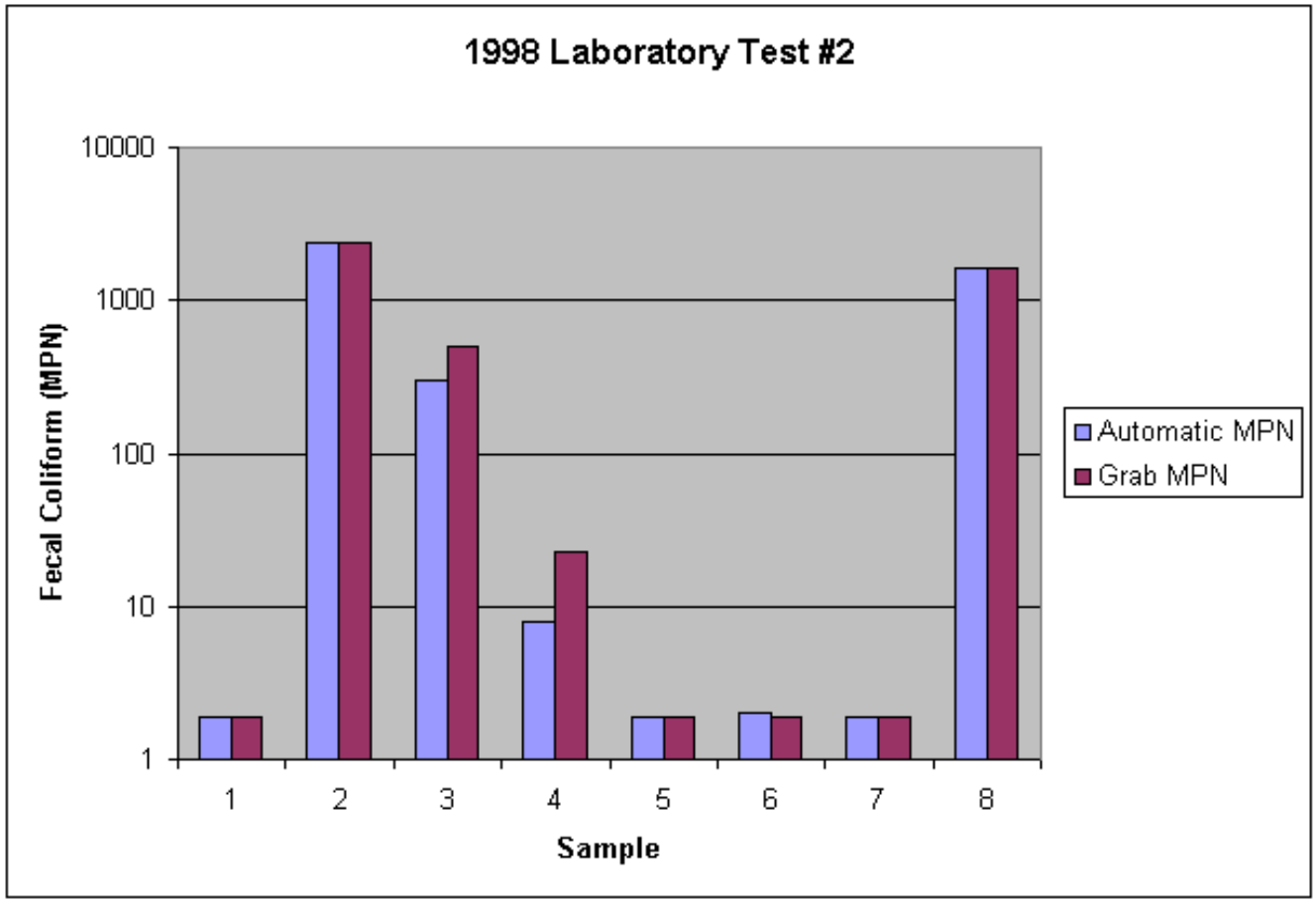
TTN	TRENTON/MERCER_CO._(ASOS)
WRI	MCGUIRE_AFB
MMU	MORRISTOWN_MUNI
EWR	NEWARK_INTL_AIRPORT_(ASOS)
TEB	TETERBORO_AIRPORT_(ASOS)
VAY	MOUNT_HOLLY_(ASOS)
12N	ANDOVER/AEROFLEX_ARPT_(ASOS)
WWD	WILDWOOD(AWOS)
CDW	CALDWELL/ESSEX_CO_(ASOS)
SMQ	SOMERSET_AIRPORT_(ASOS)
FWN	SUSSEX_AIRPORT_(ASOS)
NEL	LAKEHURST_NAS
MJX	TOMS_RIVER

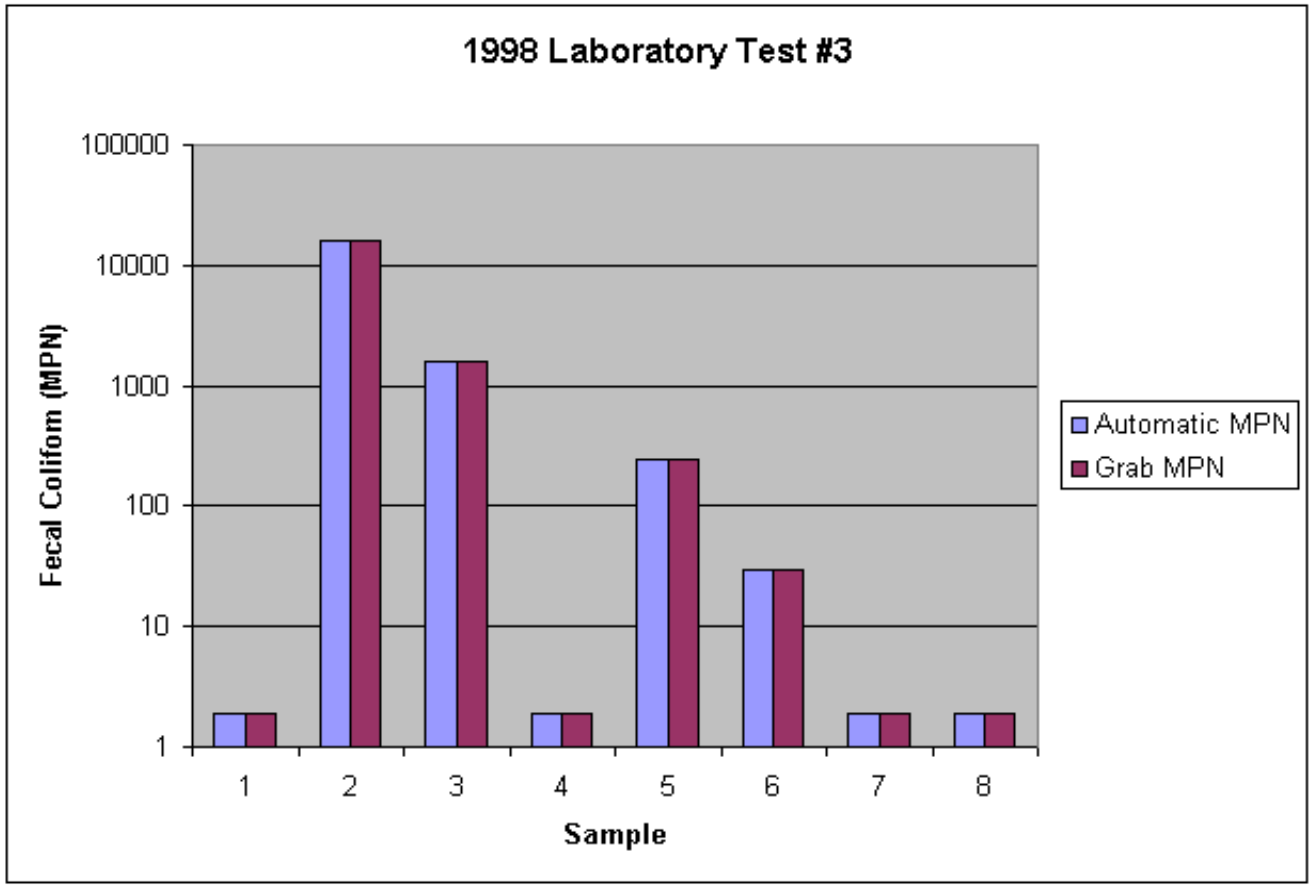
Automatic samplers for microbiological sampling

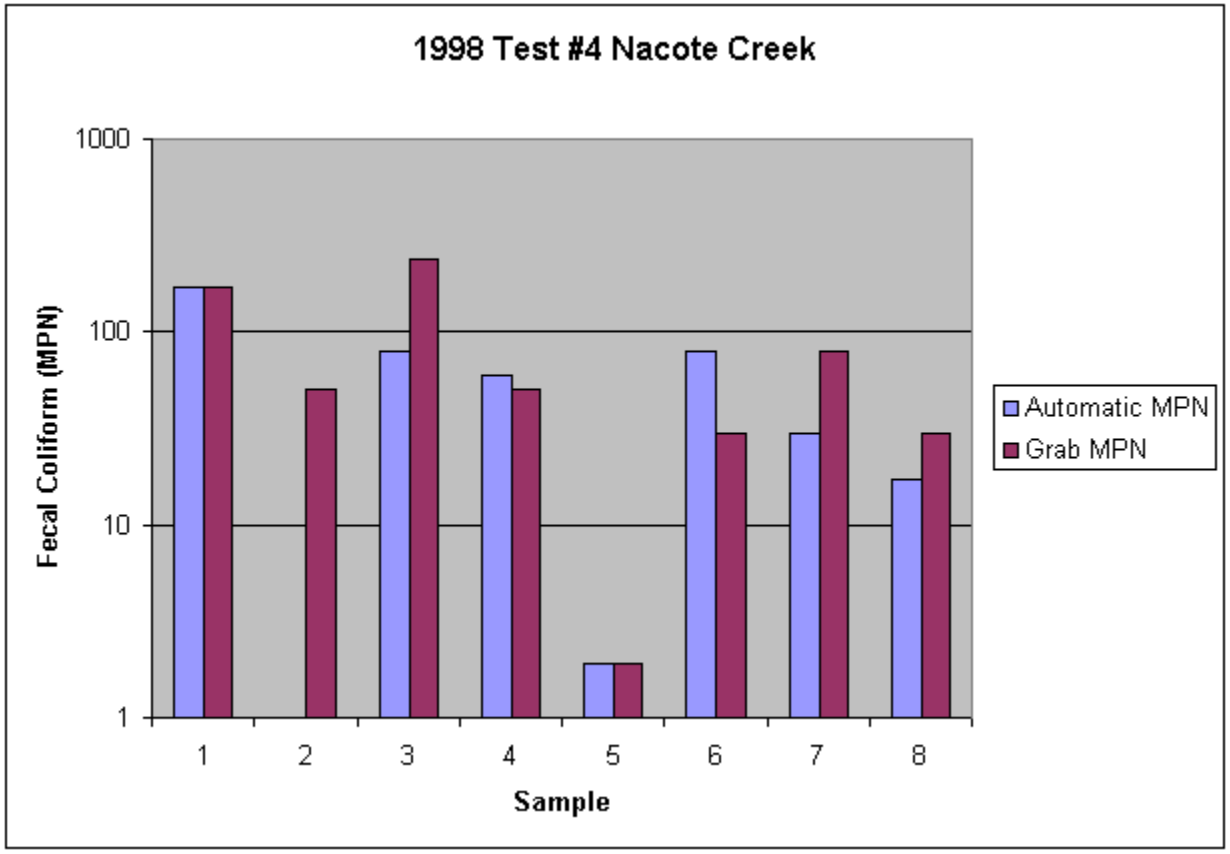
- Multiple studies over the years have allowed for the comparison of manual grab samples to automatic sampler collected samples.
- Lab studies have found the proper purging cycles for this work.
- Comparison of all data shows strong correlation.
- Drawback, cannot be used for regulatory monitoring.

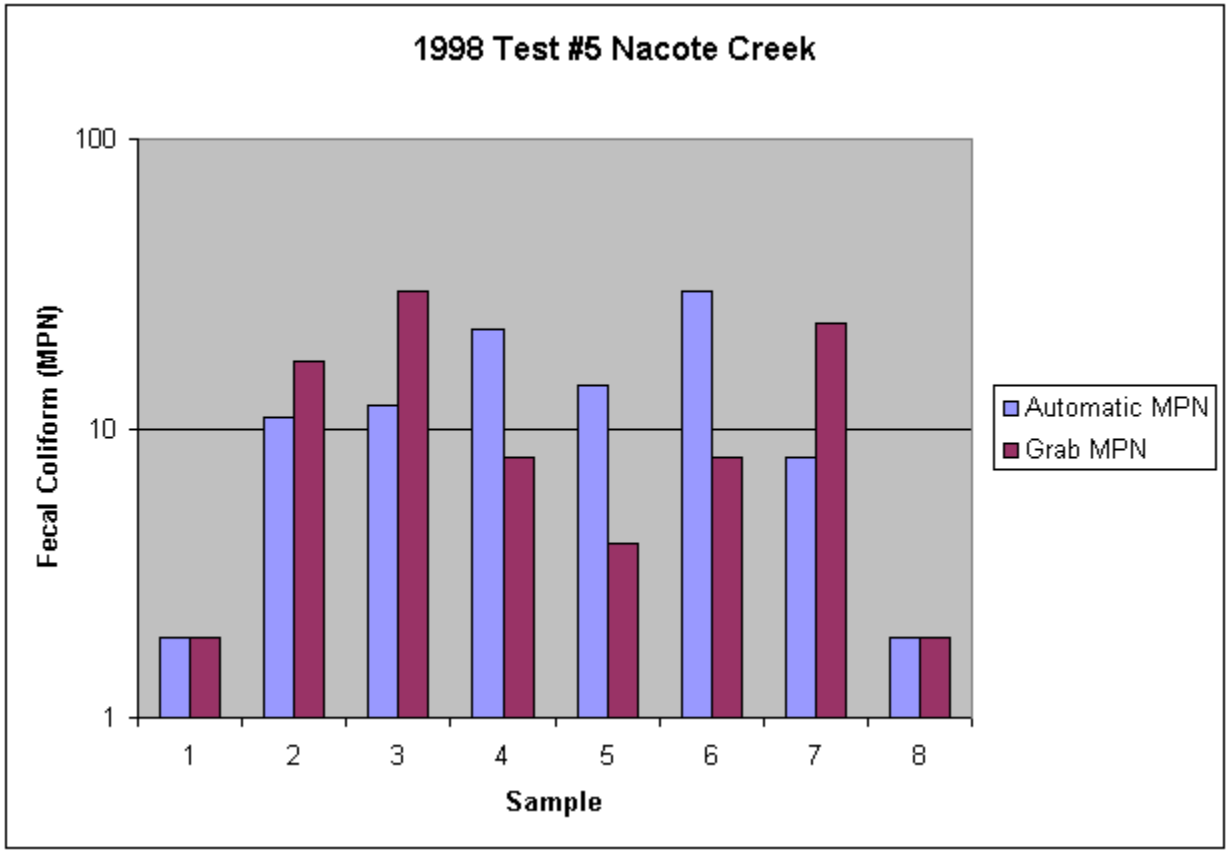
- Advantage, can collect data without the use of staff ,throughout the hydrograph, helping identify sources of contamination, to target future regulatory sampling.

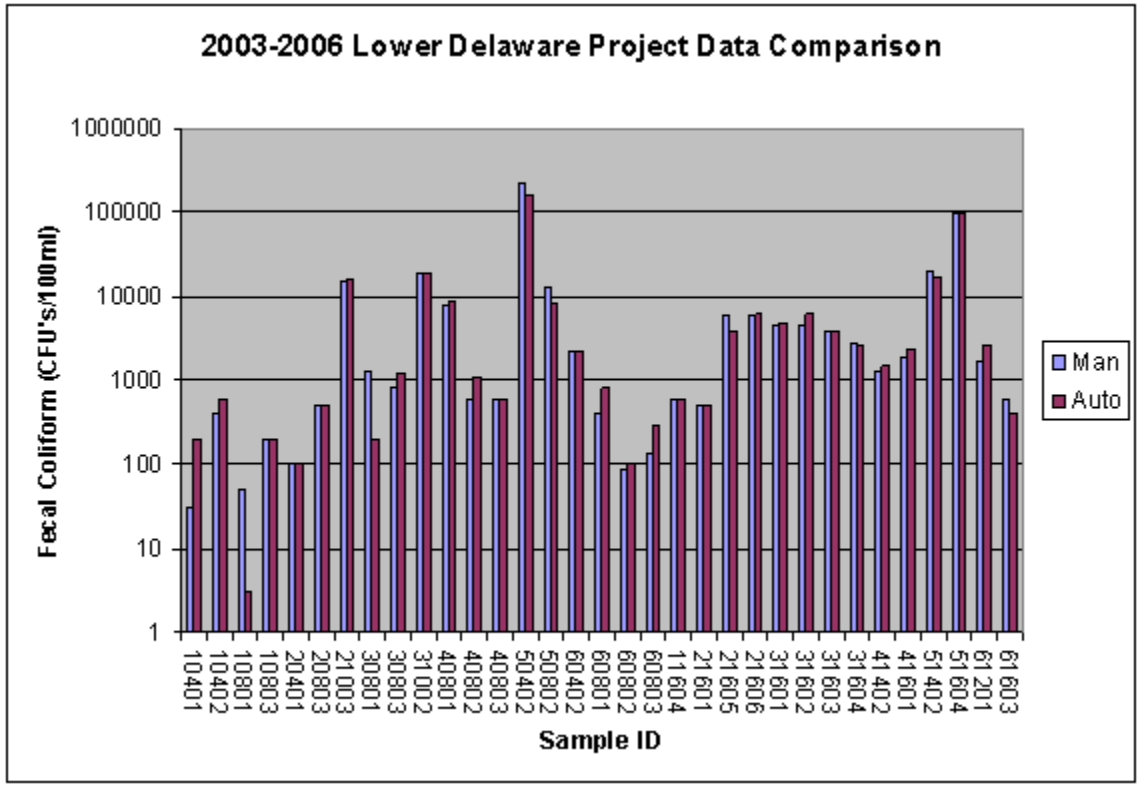

1998 Laboratory Test #1
10000
1000
100
10
1
Fecal Coliform (MPN)
1
2
3
4
5
6
Sample
Automatic MPN
Grab MPN

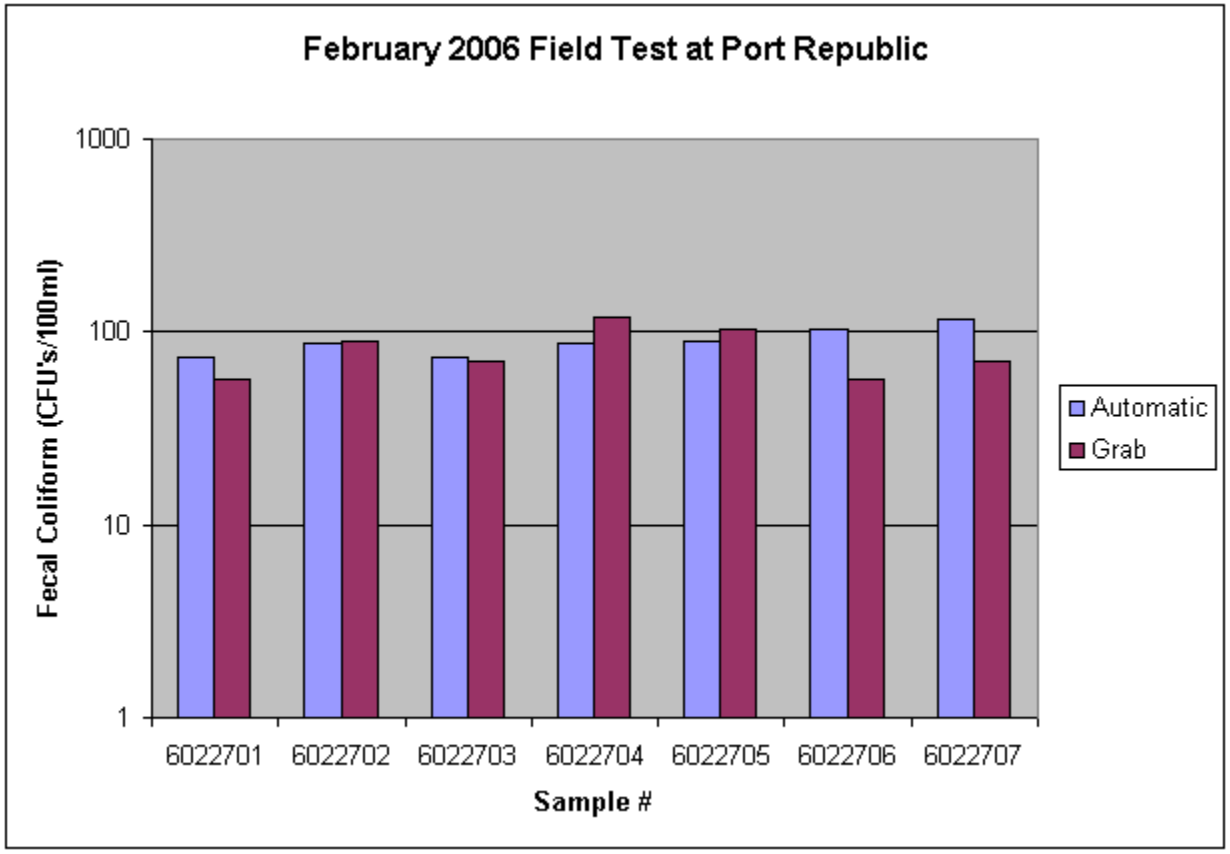

1998 Laboratory Test #2
10000
1000
100
10
1
Fecal Coliform (MPN)
1
2
3
4
5
6
7
8
Sample
Automatic MPN
Grab MPN


1998 Laboratory Test #3
100000
10000
1000
100
10
1
Fecal Colifom (MPN)
1
2
3
4
5
6
7
8
Sample
Automatic MPN
Grab MPN

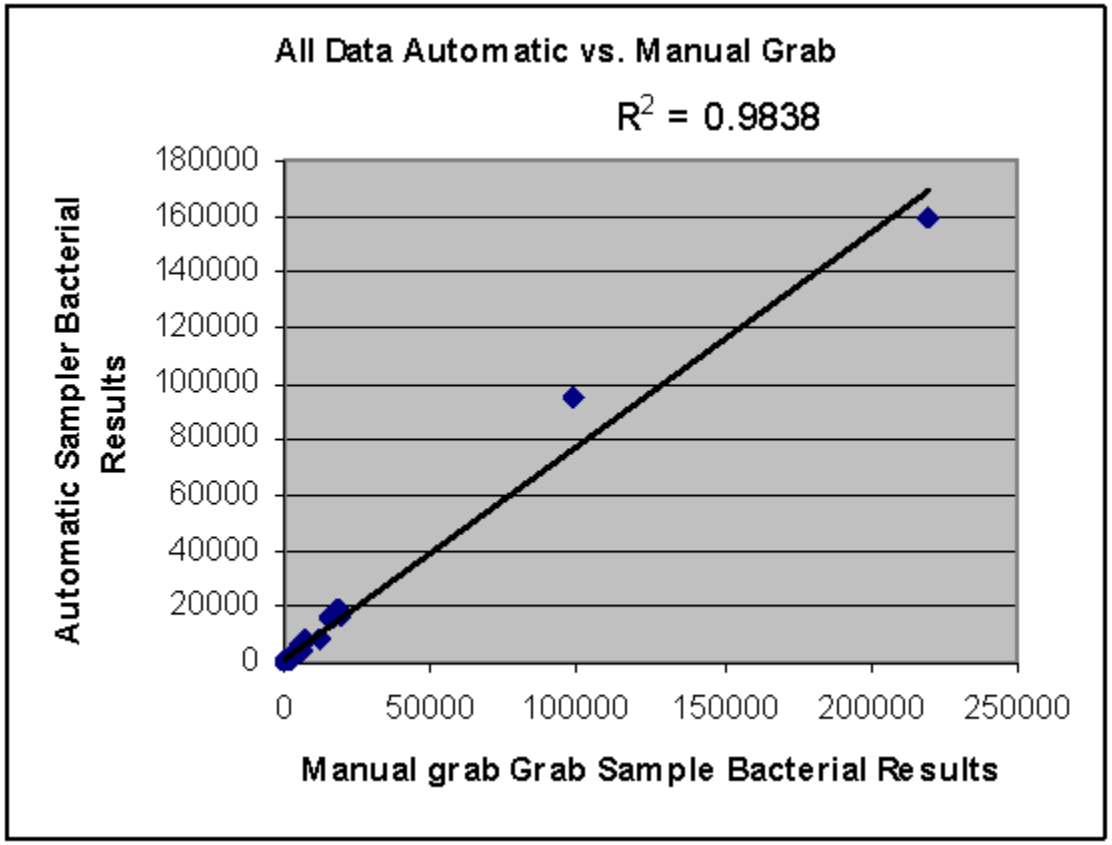

1998 Test #4 Nacote Creek
Fecal Coliform (MPN)
1000
100
10
1
1
2
3
4
5
6
7
8
Sample
Automatic MPN
Grab MPN


1998 Test #5 Nacote Creek
100
10
1
Fecal Coliform (MPN)
1
2
3
4
5
6
7
8
Sample
Automatic MPN
Grab MPN


2003-2006 Lower Delaware Project Data Comparison
Fecal Coliform (CFU's/100ml)
1000000
100000
10000
1000
100
10
1
Man
Auto
10401
10402
10801
10803
20401
20803
21003
30801
30803
31002
40801
40802
40803
50402
50802
60402
60801
60802
60803
11604
21601
21605
21606
31601
31602
31603
31604
41402
41601
51402
51604
61201
61603
Sample ID


February 2006 Field Test at Port Republic
Fecal Coliform (CFU's/100ml)
1000
100
10
1
6022701
6022702
6022703
6022704
6022705
6022706
6022707
Sample #
Automatic
Grab

DataField	Count	Geometric Mean
Automatic	77	158
Grab	77	163


All Data Automatic vs. Manual Grab
R^2 = 0.9838
Automatic Sampler Bacterial Results
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
0
50000
100000
150000
200000
250000
Manual grab Grab Sample Bacterial Results

Questions?